**WHAT IS CLAIMED**:

1.      method of preparing an alkaline size, alkenyl succinic anhydride ("ASA") in an emulsion, said method comprising the steps of:

        A.  supplying a liquid including at least ASA;

        B.  feeding a portion of said liquid of step (A) to a first input of a manifold;

        C.  feeding a first stream of emulsifier into a second input to said manifold, said liquid combining with said emulsifier within said manifold to form a second stream comprising a mixture of at least ASA and said emulsifier;

        D.  feeding the second stream of step (C) through a mixing means which imparts energy to break down said ASA into particles;

        E. dividing an outflow from said mixing means (i) through a recycling loop to at least a third input of said manifold and (ii) to an output stream of said system, said output stream having a ratio of ASA to emulsifier set by the relative volumes of said streams of Step (C); and

        F.  feeding said recycled emulsion of step (Ei) into said mixing means of step (D).

2.      The method of claim 1 wherein said liquid of step (A) includes said ASA and a surfactant.

3.      The method of claim 1 wherein said mixing mean of step (D) imparts a number of shear events to the emulsion which is sufficient to provide an energy factor index in the range of about 2200-17000

4.      The method of claim 3 wherein said energy factor index is about 5632-5800.

5. The method of preparing an alkaline size, alkenyl succinic anhydride ("ASA") in a heated emulsion, said method comprising the steps of:

    A. supplying a liquid including at least ASA;

    B. feeding a portion of said liquid of step (A) to a first input of a manifold;

    C. feeding a first stream of emulsifier into a second input to said manifold, said liquid combining with said heated emulsifier within said manifold to form a second stream comprising a mixture of at least ASA and said emulsifier;

    D. feeding the second stream of step (C) through a mixing means which imparts energy to break down said ASA into particles;

    E. dividing an outflow from said mixing means (i) through a recycling loop to at least a third input of said manifold and (ii) to an output stream of said system, said output stream having a ratio of ASA to emulsifier set by the relative volumes of said streams of Step (C) and Step (D);

    F. feeding said recycled emulsion of step (Ei) into said mixing means of step (D); and

    G. cooling said second stream in order to prevent said heated mixture from causing said ASA to deteriorate from heat imparted by activity of said mixing means in step (D).

6. The method of claim 5 wherein said cooling of step (G) comprises the further step of enclosing at least some equipment for providing said method in a temperature controlled environment.

7. The method of claim 5 wherein said enclosure providing said temperature controlled environment is a cooling housing.

8.    The method of claim 5 and the further step of providing a heat exchanger in the recycle loop of the step (Ei).

9.    The method of claim 8 wherein the heat exchanger is selected from a group consisting of a plate and frame, a tube heat exchanger, a heat sink having cooling fins, or a radiator.

10.    The method of claim 5 wherein said manifold is a block of metal having a plurality of holes therein to form bores which provide a network of pipes for transporting and delivering fluids to enable a performance of said steps, thereby minimizing an internal surface area of a delivery system for performing said steps, and said cooling of step (G) is provided by enclosing at least said manifold block in an equipment for providing a temperature controlled environment.

11.    The method of claim 5 wherein said heated emulsifier of step (C) is hot starch, and the added step of feeding said hot starch emulsifier into said manifold via an analog flow meter for reporting said feeding to a programmed logic controller and the further step of controlling at least one valve responsive to said reporting by said analog flow meter.

12.    The method of claim 11 wherein said valve controlled responsive to said reporting is in said recycling loop of step (Ei).

13.    The method of claim 11 and the further step of providing a variable speed pump for feeding at least one fluid material into said manifold, and controlling said variable speed of said pump to throttle said material feed into said manifold responsive to said report  by said analog flow meter.

14.    The method of claim 5 wherein said combined emulsifier and ASA of step (C) is diluted,

carrying out said dilution in said mixing means of step (D), said mixing means imparting a shear force to said emulsion with an energy factor index in a range of about 2200 to 17000; said energy factor continuing for a period of time wherein a total of said shear force is less than that which reduces effectiveness by degrading substantial amounts of ASA, a substantial portion of said ASA being formed into particles having a mean average particle size within the range of $0.25\text{-}2\mu$.

15.    The method of claim 14 wherein the mixing device imparts said shear force in step (C) with an energy factor index in the approximate range of about 5632-5800.

16.    The method of claim 14 wherein step (F) is carried out in a manifold formed by holes in a solid block of metal, said holes being inter-connected in order to form a network of pipes within said manifold.

17.    A system for processing a mixture of alkenyl succinic anhydride ("ASA") and an emulsion comprising

a miniature manifold formed by holes formed in a metal block, said holes forming a network of pipes and a mixing chamber inside said metal block,

means for conveying ASA and a heated emulsion to selected ones of said holes for mixing in said mixing chamber inside said metal block,

mixing means for imparting energy to a stream of said mixed ASA and emulsion in order to break said ASA into particles,

means for feeding back at least some of said stream via a recycle loop extending from said mixing means to another hole in said manifold, and

means for cooling said stream in said mixing loop to reduce the heat of said emulsion and heat imparted to said stream by said mixing means.

18. The system of claim 17 and a programmed logical controller for controlling said system, at least one analog flow meter coupled to monitor an inflow of said emulsion and to report said inflow to said programmed logical controller, at least one automatic throttle means in at least one input to said block, and means jointly responsive to said programmed logic controller and said report by said flow meter for controlling said automatic throttle means.

19. The system of claim 18 wherein said throttle means is an automatic valve in said recycle loop.

20. The system of claim 18 wherein said throttle means is a variable speed pump for feeding said emulsifier into said system.

21. The system of claim 18 and said means for cooling is carried out at a temperature which prevents hydrolyzation of said ASA.

22. The system of claim 21 wherein said cooling means is a temperature controlled enclosure surrounding at least part of said system.

23. The system of claim 21 wherein said cooling means is a heat exchanger in said recycle loop.

24. The system of claim 17 wherein said mixing means imparts energy with an energy factor index in a range of about 2200-6000.

25. The system of claim 23 wherein said energy factor is about 5632-5800.

26. The system of claim 17 wherein said mixing means produces ASA particles having an average mean size within a range of about 0.25-2m.

27. A method of processing a paper coating liquid containing at least ASA, said method comprises:

A. processing said coating liquid in a mixing manifold formed by bores in a solid block of metal;

B. subjected said ASA while outside said manifold to an energy factor index of 2200 to 6000 to provide a high level of opportunities for said ASA to be exposed to shear, said ASA responding to said shear at said energy factor index during a time period for breaking said ASA into emulsion particles having a mean average size in the order of 0.5 to 5 microns;

C. forcing said ASA particles of step (B) into a stream containing an emulsifier while inside said manifold;

D. subjecting said stream of step (C) containing said emulsifier and ASA to a primary dilution while in said manifold;

E. recycling a majority of said stream of step (D) to re-experience a repeated exposure to said high level of shear of step (B);

F. sending a minority of said stream containing an emulsifier to a system output after it leaves said exposure to shear of step (B); and

G. subjecting said stream containing an emulsifier and ASA to a secondary dilution while on its way to said system output in order to provide a finely turned amount of emulsifier and ASA relative to the total amount of said system output.

28. The method of claim 27 wherein the ASA is blended with a surfactant by the time when it is subjected to said shear at said energy factor index in step (B).

29. The method of claim 28 wherein said high level of shear in steps (B) and (E) is imparted with an energy factor index in the order of about 5632-5800.

30. The method of claim 27 wherein the shear at said energy factor index is imparted by a device selected from a group consisting of: a turbine; a centrifugal pump; a ganged stack of impellers; and a blender, said selected device having a recycle feedback loop connected between an output of said device and an inlet of said device; the recycling in step (E) of said majority of said stream occurring by diverting a portion of an output stream from said device through said feedback loop to an inlet of said manifold.

31. A system for preparing ASA by processing said ASA within a manifold formed in a solid block of metal having a plurality of holes that are formed therein to provide a plurality of bores that function as a network of pipes for conveying liquids; a plurality of throttle means individually associated with inputs to said bores; a source of the ASA coupled to a first of said bores via one of said throttle means; means for pressurizing and conveying said ASA at a high pressure through said first bore in said block of metal; means for introducing an emulsifier into a second of said bores via a second of said throttle means; means within said manifold for combining said pressurized ASA and said emulsifier in a single stream; means comprising a recycling loop coupled from said manifold through mixing means for imparting an impacting shear with an energy factor index in the order of 2200-6000 and on to a third of said bores, said means for imparting shear continuing for a period of time which provides particles

having a mean average within a range of 0.25-2μ; pressure regulating means; and means for taking a system output from a fourth of said bores via said pressure regulating means.

32.     The method of any one of the claims 1, 5, 17, or 27 and control means for enabling a continuous testing of particles during a production run, said control means operating responsive to a detection of a light scatter and absorption.

33.     The method of any one of the claims 1, 5, 17, or 27 wherein said shear is carried out with an energy factor index which produces particles in said ASA, said particles having a mean average in a range of 0.5 to 3 microns.

34.     The method of any one of the claims 1, 5, 17, or 27 wherein said shear is carried out with an energy factor which produces particles in said ASA, said particles having a mean average of about 1 micron.

35.     A method of preparing an alkaline sizing comprising the steps of:

A.   forming a fluid by mixing an emulsifier and a sizing agent to form a combined fluid stream;

B.   applying a shear force to said combined fluid stream with enough shearing events per unit of time to produce a shearing force having an energy factor index of at least 2200 which produces particles in a mean average range of about 0.1 to 3 microns.

C.   dividing a stream created in step (B) into two parts;

D.   recycling one of said two parts of said stream of step (C) in order to rejoin the combined fluid formed in step A; and

E. directing the other of said two parts of said stream of step (C) to an output in order to provide a finished stream.

36.   The method of claim 35 and the added step of providing a solid block with a manifold formed therein, said steps involving said fluid being carried out in said manifold formed within said solid block.

37.   The method of claim 35 and the further step of imparting said shearing force of step B with an energy factor index in an approximate range of 2200-6000.

38.   The method of claim 35 and the further step of imparting said shearing force with an energy factor index in an approximate range of about 5632-5800.

39.   The method of any one of the claims 35-38 wherein the mean average range of particle size is about 0.25-2 microns.

40.   A method of breaking alkenyl succinic anhydride ("ASA") into a predetermined range of particle sizes having a predetermined mean average particle size, said method comprising:

(1)   providing at least one mixing head means having a predetermined number of blades in an area containing ASA;

(2)   operating said mixing head means at a predetermined speed whereby said blades strike the ASA to impart a selected number of shearing events per unit of time; and

(3)   selecting a time period during which said operations of step 2 occur in order to produce an energy factor index in a range of about 2200-17000;

said energy factor index being determined by the relationship:

$$\frac{\text{number of said shearing events x velocity of said blades in ft/min x contact time}}{1{,}000{,}000.}$$

41.    The method of claim 40 wherein said mixing head means is a rotating set of said blades and said number of shearing events in step (2) is determined by the relationship:

number of blades x number of mixing head means x revolutions per minute.

42.    The method of claim 40 wherein said energy factor index of step (3) is in the range of about 5632-5800.

43.    The method of claim 40 wherein said energy facto index of step (3) is in a range of about 2200-6000.

44.    The method of claim 40 wherein the predetermined mean average particle size is within the range of 0.25-2μ.

45.    The method of claim 40 wherein the predetermined mean average particle size is within the range of about 0.5 to 5μ.